Executive Summary

Introduction

California is strongly committed to protecting its rich and diverse environmental resources. Over the years, substantial efforts have been devoted toward this end. In many instances, the state has been recognized as a national and international leader in developing environmental standards, yet there are very few meaningful, objective measures with which to assess the environmental impacts of these standards.

The Environmental Protection Indicators for California (EPIC) Project was created to support a commitment to use measurable results in judging the effectiveness of the state's efforts directed at environmental protection. This report presents the work products of the first year of the EPIC Project, which was devoted to establishing the framework for an environmental indicator system. The framework consists of guidelines and criteria for identifying and selecting indicators, the environmental issues that are important for California to track, and an initial set of indicators. The EPIC Project will continually evaluate, improve and expand this initial set of indicators to ensure that it provides meaningful information for better understanding the state of California's environment, and for planning and decision-making.

Environmental indicators are scientifically based measures that convey complex information on environmental status and trends in an easily understood format. They communicate information to the public as well as improve our understanding of the environment. Environmental indicator systems have been used around the world and in the United States at the federal and state level, and by local communities.

The Initial Set of Environmental Indicators

Environmental indicators were developed for significant environmental issues in the following broad areas:

- Air quality
- Water
- Land, waste and materials management
- Pesticides
- Transboundary issues
- Environmental exposure impacts upon human health
- Ecosystem health

An additional set of "background indicators" was also developed. These indicators reflect trends in certain demographic, economic, human health and other parameters that can provide a meaningful context with which to interpret some of the environmental indicators. A complete list of all the indicators can be found at the end of this summary.

SUMMARY

The process by which issues were identified, and indicators selected, is described in Chapter 2. The initial focus of the EPIC Project is on indicators that:

- reflect issues affecting California, or global or transboundary issues of interest to the state;
- relate to Cal/EPA's mission to protect, restore, and enhance the environment, and to areas where this mission overlaps with those of the Resources Agency and the Department of Health Services; and,
- measure human-induced pressures on the environment, ambient environmental conditions, or effects on human or ecological health.

Indicator selection relies on primary criteria designed to ensure that the indicator is based on data collected using scientifically acceptable methods, closely represents the issue, is sufficiently sensitive to distinguish change, and provides a meaningful basis for policy decisions. A set of "secondary criteria" highlight additional desirable attributes of an environmental indicator: ability to provide early warning, comparability to indicators in other systems, cost-effectiveness, and the availability of a point of reference or a benchmark value.

The indicators are classified based on the availability of data. Type I and Type II indicators are supported by ongoing, systematic monitoring or data collection. For Type I indicators, adequate data are available to present a status or trend graphically. Type II indicators require further data collection, analysis or management. Type III indicators are conceptual (sometimes based on a one-time study), and reveal areas lacking systematic data collection.

Findings

This report takes an important first step in presenting a collection of environmental indicators derived from various sources, spanning a wide range of significant environmental issues confronting California. The indicators, individually and collectively, can provide better understanding of what is known about the state's environment, what information is needed, and what the potential problem areas might be and possible ways of addressing them and measuring success.

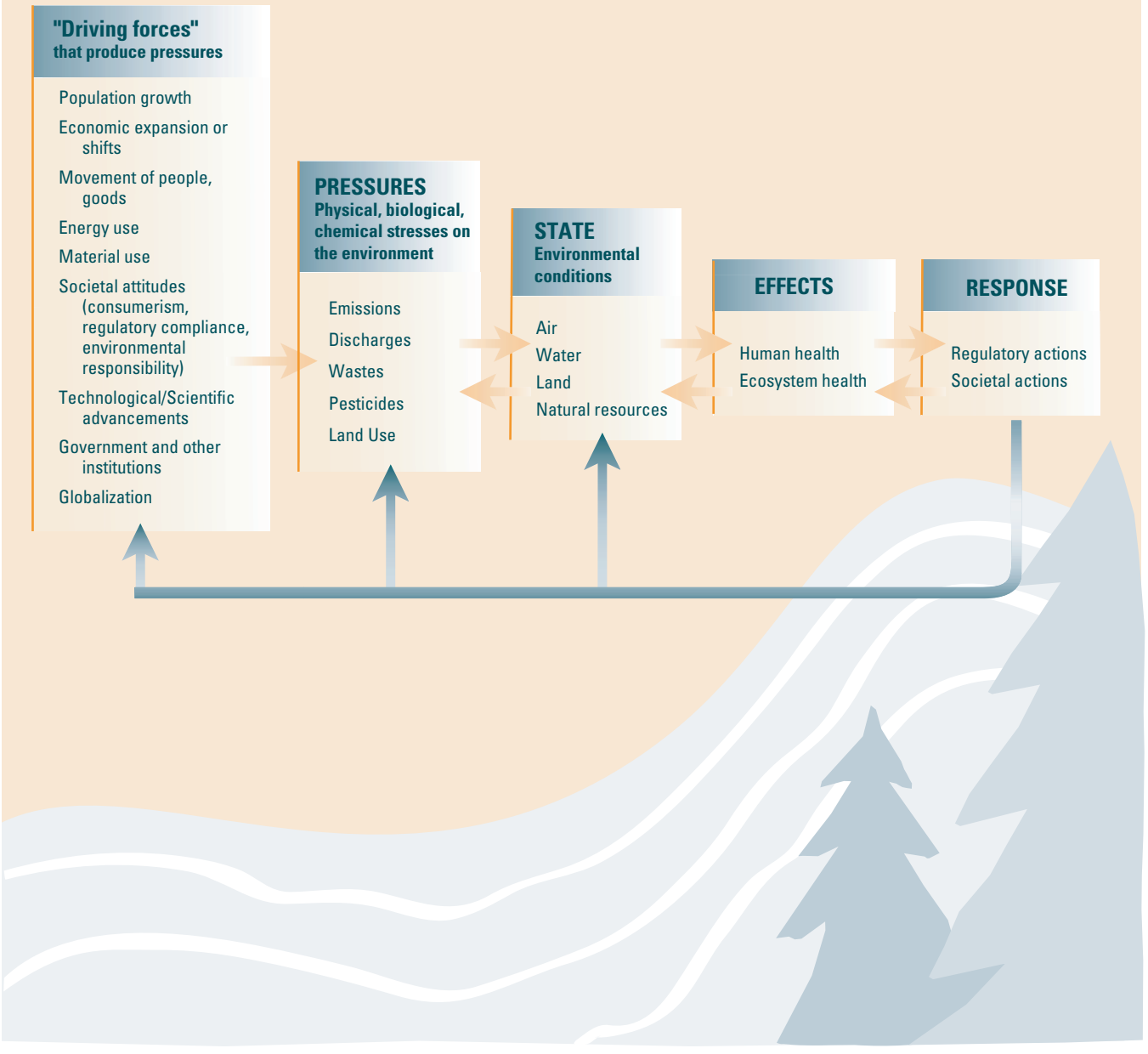
Valuable insight can be gained by viewing indicators with reference to the "pressure-state-effects-response" conceptual model, which is discussed in Chapter 1. The diagram on the following page extends the model to include driving forces that can produce pressures upon the environment. Some of the background indicators in this report reflect trends in these "driving forces." One such driving force is population growth. Already the most populated state in the country with its estimated 35 million residents, California continues to grow faster than the rest of the nation, adding over half a million people to its population every year for the past four years. Significant pressures are exerted on the state's environment and natural resources by the size and growth rate of the population. In addition, population growth influences other significant driving forces such as the economy, land use, the need to move people and goods, and energy use.

Certain environmental indicators in this report show trends that are consistent with the state's goals of improving, restoring or preserving the environment. For example, emissions and ambient levels of certain air pollutants generally show declining trends. Contaminants in drinking water are rarely found at levels exceeding regulatory standards. Increasingly more solid waste is being diverted from landfills, and less hazardous waste is produced per unit of economic activity. The positive trends in these areas are attributable in large part to current environmental programs.

Other indicators show a lack or improvement or a worsening of environmental conditions. The population of winter run Chinook salmon in the Central Valley has declined to extremely low levels. The clarity of Lake Tahoe, an indicator of overall lake function, continues to decline. The population of the desert tortoise, a federally designated endangered species, has declined significantly since 1980. In some air basins, levels of inhalable particulate matter have not been significantly reduced over the last ten years.

Finally, additional challenges stem from a lack of data with which to gauge the status of certain environmental issues. For example, status and trend data are lacking on such issues as indoor air quality, the impacts of pesticide

The Pressure–State–Effects–Response Model



use on air and water quality, the impacts of environmental exposures on human health, and many aspects of the state's natural resources.

Key findings and future directions for each issue area are discussed below.

Air Quality

Extensive monitoring of air pollutants by the state originally arose out of the need to tackle some of the worst urban air pollution in the country. Over the past 20 years, technological advances and regulatory strategies have yielded significantly cleaner air. The indicators for air quality show the following:

- Criteria air pollutants, most of which arise from combustion of petroleum products, are the major pollutants found in urban smog. Levels of inhalable particulate matter (PM10) have been only modestly reduced in the major air basins and not significantly in a few others. Urban sources of PM10 currently represent one of the biggest challenges in reducing air pollution. While ozone still exceeds California standards in five major air basins, significant improvements have occurred in all air basins over the last 20 years. Carbon monoxide has ceased being a major air pollutant in all areas of the state, except in some Mexican border areas and in the South Coast Air Basin, where exceedances of the standard occasionally occur.

- Toxic air contaminants include over 180 chemicals, many of which are potential carcinogens. EPIC indicators to describe the levels and risks associated with these substances in California's air are under development. However, initial data show an overall 40 percent reduction in emissions and ambient concentrations of toxic air contaminants in urban air basins over the last 10 years.

- One of the most intuitive measures the public uses to assess air quality is visibility. A comprehensive, consistent indicator of the degree of clarity of the atmosphere is currently under development. Small particles in the air are a major component in causing visibility impairment.

- Pollutants found indoors may present a greater hazard than outdoor pollutants. Indoor pollution is not monitored on an ongoing basis to provide an indicator, although current research has focused on sources of, and levels of exposure to, indoor pollutants. Indoor air quality is a significant issue requiring data collection for indicator development.

Future EPIC updates will include indicators for very small inhalable particulate matter (PM2.5) produced primarily by combustion, an emissions inventory for toxic air pollutants, and community-based air quality indicators.

Water

California's water needs must be met by an adequate supply of water of the quality appropriate for many purposes (called "beneficial uses"), including drinking, swimming, fishing, supporting aquatic life and habitat, and agricultural and industrial uses. The indicators for water show the following:

- Since 1984, less than one percent of the 20,000 municipal drinking water sources in the state contain concentrations of contaminants that exceed drinking water standards.

- The number of leaking underground fuel tank sites has been declining since 1995, a trend resulting from the upgrading of nearly all active tanks. Of the 38,000 tanks examined in 2000, 17,000 were leaking; approximately 15 percent of these are potential threats to drinking water supplies.

- Commercial shellfish growing waters, which have been monitored for over a decade, continually meet the regulatory standard for fecal coliform bacteria during the open harvesting periods.

- An indicator of short-term impairment, the number of sewage and petroleum spills into water, increased by 33 percent, from 1,445 in 1997 to 1,918 in 2000. The number of sewage spills alone increased by 76 percent.

- Data to present trends in surface water quality – in terms of the extent by which surface waters support beneficial uses (such as aquatic life protection and

swimming) — are not available. A snapshot of the 2000 assessment is presented. Trends will result with implementation of new monitoring programs.

- Coastal beach closures due to bacterial contamination increased 15 percent from 1999 to 2000. With the recent standardization of beach posting protocols, more consistent and meaningful trends will be available in the future.

- Trends presented for the safety of consuming fish caught from coastal areas are based on assessments done on 35 percent of the total number of acres of bays and estuaries, and on 12 percent of the total ocean coastline miles. The assessments determine whether the levels of chemical contaminants found in sport fish caught from a water body are such that the general public can safely eat at least one meal a week. Between 1995 and 2000, the safety of consuming fish from coastal waters remained stable; the safety of consuming fish from bays and estuaries appears to have declined.

- Because water supply is a major concern for California, forecasting of water needs has been going on for many decades. Largely due to the state's increasing population, the urban water use has increased from 1994 to 1998. At the same time, agricultural water use has leveled off.

- Per capita urban water use production has increased since 1940.

- Recycling or reuse of municipal wastewater increased by 50 percent in the past 13 years.

Establishing a comprehensive set of water indicators presents a formidable challenge. Until recently, comprehensive and consistently collected data needed for indicator development were lacking for many beneficial uses of water. In the future, it is expected that a more complete picture of California's water quality can be presented. Data to be collected under the State Water Resources Control Board's (SWRCB) Surface Water Ambient Monitoring Program will greatly enhance the state's ability to track trends in surface water quality. Similarly, the groundwater indicators will be enhanced by information generated by the SWRCB's Groundwater Ambient Monitoring Assessment Program. To track the safety of consuming fish from inland waters, efforts similar to those taken under the Office of Environmental Health Hazard Assessment's Coastal Fish Contamination Program are needed to collect the necessary data.

Land, Waste And Materials Management

Waste is a by-product of human activity and, if not managed properly, can exact considerable costs in terms of lost resources, environmental contamination, and adverse effects on human health. California's waste management programs seek to reduce the potential for such adverse impacts by promoting reuse or recycling to divert wastes from landfills or the prevention of waste generation in the first place, and through regulations designed to ensure the safety of waste storage, treatment and disposal. Where past practices have contaminated land, water and air, the state performs or oversees the cleanup of sites to prevent further contamination and harmful human exposures to hazardous constituents or decomposition products of the waste. Indicators relating to solid and hazardous wastes show that:

- Statewide diversion of solid waste has increased by 500 percent over the past 11 years, from 5 million tons diverted in 1989 to 28 million tons in 2000. Although waste generation increased during the same period, disposal at landfills has decreased by 13 percent, declining from 44 million tons in 1989 to 38 million tons in 2000.

- The disposal of waste tires has decreased over the past 10 years, while diversion has more than doubled, from an estimated 9.2 million tires in 1990, to 23 million in 2000. The development of viable markets for used tires is a key to continuing this trend.

- The amount of hazardous waste generated and shipped for treatment or disposal over the past seven years has increased by 16 percent, from 2.3 million tons in 1993 to 2.7 million tons in 2000. However, when economic activity is taken into consideration, waste generation has declined by 30 percent.

- Both recycling and disposal of hazardous waste in landfills have increased since 1993. In 2000, 40 percent of hazardous wastes ended up in landfills while about 33 percent was sent to recyclers.
- No clear trends were noted for hazardous material spills or soil cleanup at hazardous waste sites.

Future efforts will attempt to address site contamination and the impact of remediation efforts on the environment, and the impacts of households on the overall solid and hazardous waste streams.

Pesticides

Pesticides are unique among toxic chemicals in that they are deliberately released into the environment to achieve a specific purpose. While pesticides have brought significant benefits, they have the potential to adversely impact human and ecological health because of their inherent toxicity. Hence it is important to track the human and ecological effects of pesticides, as well as the presence of pesticides in air, water or produce. The pesticide indicators in this report show that:

- Less than two percent of the fruits and vegetables sampled since 1989 contained illegal residues of pesticides. More than 7,000 samples are tested annually.
- Reported Illnesses related to occupational pesticide exposures declined by about 60 percent in the past decade (from 2,016 reports in 1988 to 804 in 1999), occurring less frequently in agricultural settings.
- Pesticide contamination of groundwater can only be partially characterized at this time. Limited information is available on the magnitude and scope of the impacts of pesticides in surface water.
- No ongoing monitoring for pesticides that have been identified as toxic air contaminants is being conducted at present.

Future efforts will focus on developing a meaningful indicator of pesticide use based on environmental and toxicological considerations, characterizing the presence of pesticides on air and water quality, enhancing the indicator for pesticide-related illnesses, and tracking the ecological impacts of pesticides.

Transboundary Issues

The movement of certain pollutants by natural processes, meteorological forces, and human activities can produce environmental threats which extend beyond California's geographical boundaries. Conversely, pollutants which originate in other states, countries or ecosystems, carried by atmospheric air currents, watersheds, trade, and travel can impact California. In this report, the transboundary issues include global climate change, stratospheric ozone depletion, pollution in the California/Baja California, Mexico border region, and invasive species. The transboundary indicators show that:

- Compared to the rest of the United States, California emits less of the greenhouse gas carbon dioxide, when calculated per person and per unit of the economy. However, compared with other developed nations, California emits more.
- California air temperatures have gone up approximately 1 degree Fahrenheit (1°F) in rural areas over the past century, compared to an increase of about 3°F in cities with the "urban heat island effect," which can skew temperature readings. Global air temperatures are estimated to have increased by 0.5°F to 1.0°F since the late 19th century.
- Global warming may escalate sea level rise. California's mean sea level as shown by tidal measurements in the past century has risen, but local land subsidence, and conversely, geologic uplifting of land mass can affect tidal calculations.
- The protective stratospheric ozone layer has gradually decreased over the mid-latitudes of the Northern Hemisphere (including California and the continental U.S.) from 1979 to the early 1990s. However, the downward trend has not continued in recent years as levels of ozone-depleting substances, including bromine and chlorine, stabilize in the stratosphere. Due to additional atmospheric processes that occur in the Polar Regions, ozone depletion in these regions is generally greater than over California.

- California and Mexican air monitoring stations in the San Diego/Tijuana and Imperial Valley/Mexicali border areas reported peak ozone, carbon monoxide and inhalable particulate matter (PM10) concentrations that continue to exceed California air quality standards.

In the future, some of the efforts to address climate change issues will investigate emissions of other greenhouse gases such as methane and nitrogen oxide emissions; correlate the ocean's offshore sea surface temperature influence on inland air temperatures; and study trends in soil moisture, precipitation intensity, wind velocity, sea wave height and intensity, plant blooming cycles, and animal and insect migrations. With respect to trans-border pollution issues, future efforts will focus on water quality in the border region, and the movement of hazardous waste to and from Mexico and other areas outside California.

Human Health

The health of Californians is generally very good and improving as a result of many factors, including advances in health care, healthier lifestyles, and reduced exposures to environmental pollutants. Infant mortality rates continue to decrease, from almost 8 deaths per 1,000 live births in 1990 to slightly more than 5 deaths per 1,000 live births in 1999. The life expectancy of Californians continues to increase, and compares favorably to national averages. (In 1997, life expectancy at birth was 75.5 years for males and 80.7 years for females in California, compared to 73.6 for males, and 79.4 for females nationally.) Despite these improvements, some human health conditions appear to be getting worse. For example, asthma rates have been increasing over the years, for reasons not yet well understood.

Most environmental protection programs are aimed at protecting human health against harmful exposures to environmental contaminants. Many of the indicators in this report relate to human health. Indicators presented in the human health section are those that reflect the impacts of exposures to environmental contaminants directly on people: the retention of toxic chemicals in human body tissues, and human conditions and diseases related to environmental exposures. Although it is known that certain environmental pollutants influence disease, other factors including genetics and lifestyle also play a role. The degree to which these various factors contribute to reported diseases or conditions from environmental pollutant exposures is largely undetermined, making it difficult to identify a cause and effect relationship that would support the development of indicators at the present time.

Developing human health indicators will require monitoring data on the occurrence and levels of bioaccumulative chemicals in the human body, such as certain toxic organic compounds, and inorganic compounds such as lead and mercury. Currently, lead is the only bioaccumulated substance for which levels in the human body are tracked and reported to the state, and only in cases when measured levels exceed a certain standard. Only two facilities report blood lead levels for all children tested; these data are not necessarily representative of children's blood lead levels in the California population.

In the future it is hoped that better surveillance of diseases and conditions, and research to relate disease occurrences to exposure to environmental chemicals, will assist indicator development.

Ecosystem Health

An ecosystem is an interdependent grouping of living and non-living components in the environment. The report addresses the health of four natural ecosystems (forests, grasslands and rangeland; the desert; freshwater aquatic; and coastal aquatic) and two ecosystems managed for the benefit of people, urban and agricultural.

The key issues of concern in the natural ecosystems are: (1) preservation of habitat quantity and quality; (2) biodiversity; and, (3) maintenance of ecological function. Changes in the structural components of an ecosystem (habitat, species diversity) can ultimately alter ecological function and the integrity of the ecosystem.

For agricultural and urban ecosystems, those managed primarily for human use, important issues are similar to those for natural systems: sufficient quality and quanity of land, positive and negative environmental impacts, and sustainability.

SUMMARY

Quality and Quantity of Habitat. Degradation of habitat, including fragmentation into small, disconnected pieces, is a key factor in the reduction of ecosystem integrity. Overall, the indicators suggest that natural resources and habitat for plants and wildlife are under significant pressure in the state. An average of 45,000 acres per year are being converted from agriculture and rangeland to urban and other uses. In the past 15 years, about 1.2 million acres of the 1982 base acreage of forest and rangeland have been converted to other uses. Siltation and eutrophication associated with nutrient run-off have reduced the clarity of Lake Tahoe. Significant alterations to California's rivers have made them unfit for many species of fish, in particular salmon.

Biodiversity. Overall, there is inadequate information on the status of threatened and endangered species in the state. The population status of about 20 percent of threatened and endangered plants and 35 percent of animals remains unknown. The populations of fewer than 5 percent of threatened and endangered plant species and about 15 percent of animal species are increasing. Information on specific species shows the following:

- The population of winter-run Chinook salmon in the Central Valley, one of the threatened and endangered species for which reasonably good information exists, continues to decline to perilously low levels. At present, these salmon spawn in only a handful of streams and have a population estimated to be less than 1,500 fish.
- The population of the least tern, a coastal shorebird, appears to be stable at present.
- The population of the threatened desert tortoise, an indicator for the desert ecosystem, has declined to very low levels.
- In two important forested areas that cover the Sierra and Cascade mountain ranges along the eastern portion of the state, the extent of the canopy of both hardwood and conifer trees has increased.

Ecosystem Function. Identifying the appropriate measures of ecosystem function is challenging. The only measure included in this report is the clarity of Lake Tahoe. Lake clarity, a measure of eutrophication (nutrient loading) as well as sedimentation, reflects many processes that occur within a lake. As an indicator, lake clarity captures multiple ecological processes of a lake, reflecting significance beyond the simple measurement of clarity. The decrease in clarity of Lake Tahoe over the past 30 years suggests that ecological functions in the lake are declining.

In some areas, little if any information is presently available for indicator development. These are identified as Type III indicators or data gaps:

- Data on the extent and distribution of exotic or non-native plants in the desert are needed to gain an understanding of the health of the desert, the most overlooked ecosystem in the state.
- While frog deformities and deaths have been documented elsewhere in the nation, scant information is available on the status of amphibian populations of the Sierra Nevada.
- Significant national efforts are underway to understand the effects of endocrine-disrupting chemicals on wildlife. In particular, treated wastewater has been shown to cause harmful effects on fish, including salmon. Information on the presence of such chemicals in California's waters needs to be collected.
- Indicators that address invasive species (also discussed as a transboundary issue) for specific ecosystems are needed.
- Persistent organic pollutants, known to cause reproductive harm and cancer, have been found in marine mammals throughout the world. Existing pilot studies suggest that these chemicals bioaccumulate in harbor seals in San Francisco Bay. Regular monitoring of seals in the state's bays and coastal areas would permit detection of problematic levels of organic contaminants.

Future efforts will address the need for indicators for agricultural and urban ecosystems and development of an indicator on the status of wetlands.

The greatest obstacle encountered in the development of ecosystem health indicators was the lack of reliable scientific information. Long-term, regionally-based,

statistically-robust ecosystem monitoring is needed to provide data for indicator development. A focus on sensitive ecological areas and coordination of efforts between the Resources Agency (especially the Legacy Project), Cal/EPA, federal agencies, and non-government organizations would enhance such an effort.

Future Directions For EPIC

The EPIC Project will aim to maintain an environmental indicator system that conveys meaningful information about key environmental issues in the state and serves a critical role in the decision-making processes in environmental programs. This will be accomplished by ensuring that the indicator system covers all pertinent issues, expanding into additional issues (such as sustainability, environmental justice and pollution prevention), if deemed appropriate; that the interrelationships among the issues are better understood; that regional indicators are developed where needed to convey more meaningful information; and that factors that influence trends are evaluated to better understand how they may be addressed by environmental programs.

Development of the indicator framework began with the identification of environmental issues that need to be better understood through indicators. The initial organization of these issues parallels the areas of responsibilities of state environmental programs. This organization facilitated the identification of possible indicators and available data. However, it also lent a program-based perspective, which may have narrowed the definition of issues and identification of possible indicators. It is necessary to better understand how pollutants, wastes, the environment, human health, ecological health, and natural resources can influence one another. Alternative ways of organizing issues will be explored to promote a more comprehensive view of the issues and their possible relationships.

To be most useful, environmental indicator systems must take advantage of new scientific knowledge, better analytical capabilities, regulatory changes, new technologies, and adapt to shifting priorities. For example, geographic information systems (GIS) represent a technological tool that will be used to enhance EPIC's ability to evaluate, manage and present indicator information. EPIC will also coordinate its activities with efforts under the Office of Environmental Health Hazard Assessment's Emerging Environmental Challenges Program to identify and characterize issues that may confront the state in the future. Updates of the EPIC report will be published every two years.

Finally, EPIC will continue to rely on, and endeavor to strengthen, collaborations with a variety of partners in state government as well as local governments, the regulated community, community groups and other parties with an interest in California's environment. Communicating information to a broad audience will be emphasized through the EPIC web site (www.oehha.ca.gov), regional meetings and other means.

The EPIC Project is an ambitious undertaking to better understand what is happening in the environment in order to find effective ways of preserving and improving it. This undertaking is still in its formative stage. The process for identifying and developing indicators has been established, and an initial set of indicators presented, but much work remains to be done. In the end, the development of meaningful, well-founded environmental indicators will yield substantial rewards for California by optimizing the efforts of its environmental and natural resource programs.

California Air Resources Board

California Air Resources Board

Table 1. The initial set of environmental indicators

The issues represented by the indicators are shown as italicized text. Each indicator is classified based on the availability of data, as follows:

Type I: adequate data are available for presenting a status or trend.

Type II: further data collection/analysis/management is needed before a status or trend can be presented.

Type III: conceptual indicators for which systematic data collection is not in place.

Air Quality Indicators

Criteria Air Pollutants

Ozone

- Days with unhealthy levels of ozone pollution (Type I)
- Peak 1-hour ozone concentration (Type I)
- Exposure to unhealthy ozone levels in the South Coast air basin (Type I)
- Emissions of ozone precursors —Volatile organic compounds + Oxides of nitrogen (Type I)

Particulate matter (PM10)

- Days with unhealthy levels of inhalable PM10 (Type I)
- Peak 24-hour PM10 concentration (Type I)
- Annual PM10 concentration (Type I)
- Total primary and precursor PM10 emissions (Type II)

Carbon monoxide

- Days with unhealthy levels of carbon monoxide (Type I)
- Peak 8-hour carbon monoxide concentration (Type I)
- Carbon monoxide emissions (Type I)

Toxic air contaminants (TACs)

- Total emissions of TACs (Type II)
- Community-based cancer risk from exposure to TACs (Type II)
- Cumulative exposure to TACs that may pose chronic or acute health risks (Type II)

Visibility

- Visibility on an average summer and winter day and in California national parks and wilderness areas (Type II)

Indoor air quality

- Household exposure of children to environmental tobacco smoke (Type I)
- Indoor exposure to formaldehyde (Type III)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Water Indicators

Water quality

Multiple beneficial uses

Aquatic life and swimming uses assessed in 2000 (Type I)

Spill/Release episodes – Waters (Type I)

Leaking underground fuel tank (LUFT) sites (Type I)

Groundwater contaminant plumes – Extent (Type II)

Contaminant release sites (Type II)

Drinking water

Drinking water supplies exceeding maximum contaminant levels (MCLs) (Index)

Recreation

Coastal beach availability – Extent of coastal beaches posted or closed (Type I)

Fish and shellfish

Bacterial concentrations in commercial shellfish growing waters (Type I)

Fish consumption advisories – Coastal waters (Type I)

Fish consumption advisories – Inland waters (Type III)

Water supply and use

Statewide water use and per capita consumption (Type I)

Water use efficiency – Recycling municipal wastewater (Type I)

Groundwater supply reliability (Type III)

Land, Waste and Materials Management Indicators

Waste generation

Waste generation, in general

Statewide solid waste generation, disposal and diversion, per capita (Type l)

Number of tires diverted from landfills (Type I)

Hazardous waste shipments (Type I)

Federal and California-only hazardous waste generation (Type II)

Accidents/disasters/spills/releases

Hazardous material incidents (Type I)

Waste importation/exportation

Hazardous waste imported/exported (Type II)

Disposal to land

Statewide solid waste disposal per capita (Type I)

Hazardous waste disposal (Type I)

Site contamination

Cleanup of illegal solid waste disposal sites (Type II)

Tire cleanup (Type II)

Soil cleanup (Type I)

Contaminated sites (Type I)


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Cross-media contamination

Number of environmental releases from active landfills (Type III)

Groundwater contaminant plumes – Extent (see Water section)

Contaminant release sites (see Water section)

Pesticide Indicators

Air

Number of detections of pesticides identified as toxic air contaminants and the percent that exceeds numerical health standards each year (Type III)

Water

Area with pesticides detected in well water (Type I)

Simazine and breakdown products in a monitoring network of 70 wells in Fresno and Tulare Counties (Type I)

Pesticide detections in surface water and the percent that exceeds water quality standards (Type III)

Pesticides in food

Percent of produce with illegal pesticide residues (Type I)

Pesticide use

Pesticide use volumes and acres treated, by toxicological and environmental impact categories (Type II)

Integrated pest management

Number of growers adopting reduced-risk pest management systems and the percent reduction in use of high risk-pesticides (based on Alliance grant targets) (Type II)

Human health

Number of reported occupational illnesses and injuries associated with pesticide exposure (Type I)

Ecological health

Number of reported fish and bird kills due to pesticide exposure each year (Type II)

Transboundary Indicators

Global pollution

Climate change

Carbon dioxide emissions (Type I)

Air temperature (Type l)

Annual Sierra Nevada snowmelt runoff (Type I)

Sea level rise in California (Type I)

Stratospheric ozone

Stratospheric ozone depletion (Type I)

Trans-border pollution

California-Baja California, Mexico border issues

Air pollutants at the California/Baja California, Mexico border (Type I)

Domestic border issues

Amount of hazardous waste imported/exported (See Land, Waste and Materials Management Section) (Type II)

International border issues

Ballast water program (Type III)

Indicators of Environmental Exposure Impacts Upon Human Health

Human body concentrations of toxic chemicals

Surveillance of persistent organic pollutants in body tissues and fluids

Concentrations of persistent organic pollutants in human milk (Type III)

Lead in children and adults

Elevated blood lead levels in children (Type II)

Mercury in children and adults

Mercury levels in blood and other tissues (Type III)

Ecosystem Health Indicators

Land cover and management & threatened and endangered species

Land cover

Land cover of major terrestrial ecosystems in California (Type I)

Land management

Land management in California (Type I)

Threatened and endangered species

California threatened and endangered species (Type I)

Health of aquatic and coastal ecosystems

Aquatic life protection and biodiversity

Status of Central Valley chinook salmon populations (Type I)

California least tern populations (Type I)

Persistent organic pollutants in harbor seals (Type III)

Habitat and water quality protection

Clarity of Lake Tahoe (Type I)

Stream bioassessment - invertebrate populations (Type II)

Endocrine-disrupting chemicals in aquatic ecosystems (Type III)

Desert ecosystem health

Alteration in biological communities

Status of the desert tortoise population (Type I)

Habitat degradation

Impacts of off-highway vehicles on the desert (Type II)

Distribution of exotic plants (Type III)

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Health of forests, shrub land, and grassland (terrestrial) ecosystems

Habitat quality and quantity

- Change in habitat quantity in rangelands and forests (Type I)
- Change in forest canopy (Type I)
- Pest and disease related mortality in forests (Type I)
- Wildfires in forests and grasslands (Type I)
- Sustainability of California's forests (Type I)

Loss of biodiversity

- Status of northern spotted owl (Type II)
- Status of amphibian populations (Type III)
- Ozone injury to pine needles (Type III)

Agroecosystem health

Availability of natural resources

- Conversion of farmland into urban and other uses (Type I)
- Soil salinity (Type II)

Positive and negative environmental impacts

Urban ecosystems

- Urban tree canopy (Type III)

Background Indicators*

Population Demographics

- Total California population
- Annual population growth

Economy

- Gross State Product (GSP)

Energy Consumption

- Total energy consumption vs. GSP
- Energy consumption in California by sector (transportation, industrial, residential, and commercial)
- Residential energy consumption per household

Transportation

- Motor gasoline consumption, vehicle miles traveled, and efficiency

Human Health

- Life expectancy at birth for the United States and California; including a status of leading causes of death in California
- Infant death rate
- Self-reported asthma prevalence among adults in California and U.S.
- Estimated U.S. annual average rate of self-reported asthma

Water supply

- California's water supplies with existing facilities and programs

Land use

- Progression of development of California's land

* Background indicators do not represent particular environmental issues in themselves, but provide information with which to interpret the meaning of various environmental indicators presented in this document.